Form expressions

Notes and guidance

This small step is children's first experience of forming algebraic expressions using letters to represent numbers.

Children learn that phrases such as "2 more than a number" can be written more simply as, for example, "$x + 2$" or "$y + 2$". They also learn the convention that, for example, "$3t$" means 3 multiplied by t; as multiplication can represent repeated addition, this is also a simpler way of writing $t + t + t$. They use cubes and base 10 ones to represent expressions, with each cube representing an unknown number, x (or any letter), and the ones representing known numbers.

Children then revisit function machines, where x (or any letter) can represent the input. Discuss why it is not important at this stage to know what x represents, and that it could be any number input into the function machine.

Bar models can also be used to support children's understanding.

Things to look out for

- Children may assume that certain letters always represent specific numbers, for example a means 1, b means 2, c means 3 and so on.

- Children may not see $a \times 3$ and $3a$ as the same thing.

Key questions

- What could x represent?

- How can you represent this expression using a bar model?

- How else can you write $a + a$?

- What is the same and what is different about the expressions $x + 5$ and $5x$?

- If the input is p, what is the output?

- If m is the input, what is the output after the first operation? What is the output after the second operation?

Possible sentence stems

- _____ more than x can be written as _____

- _____ + _____ + _____ = 3 × _____ = _____

- If I have _____ x and I add/subtract _____ x, then I have _____ x altogether.
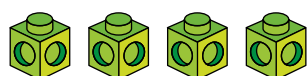
National Curriculum links

- Use simple formulae

- Express missing number problems algebraically

Form expressions

Key learning

- Jo and Max are using cubes to represent unknown numbers and base 10 ones to represent 1
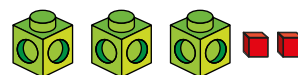
  $= x$ $= 1$

  I have 4 lots of x, which I can write as $4x$.

  Jo

  I have $3x$ and 2. This is $3x + 2$

  Max

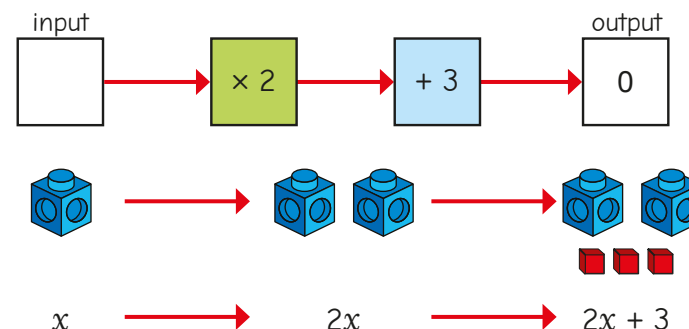 Use Jo and Max's method to write algebraic expressions for each set of cubes and base 10 ones.

  ▶   ▶

  ▶   ▶

- Use cubes and base 10 to represent the algebraic expressions.
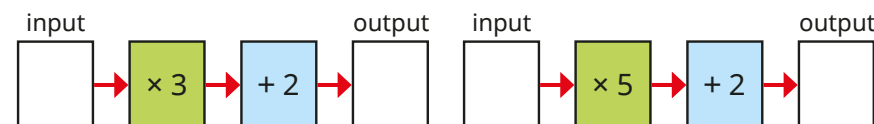
$y + 3$	$2y + 1$	$5 + 5y$

- Dan writes an expression for the 2-step function machine.

  input   output
  | ☐ | → | × 2 | → | + 3 | → | 0 |

  x ⟶ $2x$ ⟶ $2x + 3$

  Use Dan's method to write an expression for each function machine.

  input   output   input   output
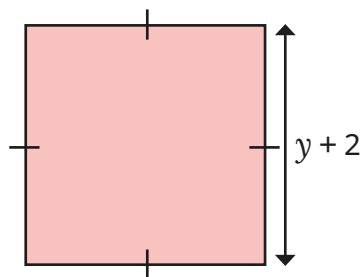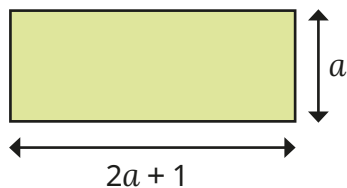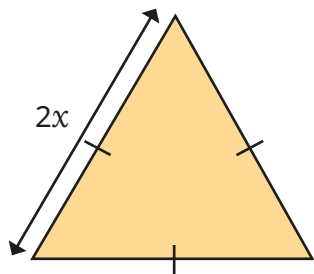 | ☐ | → | × 3 | → | + 2 | → | ☐ | | ☐ | → | × 5 | → | + 2 | → | ☐ |

- I think of a number, double it, then add 7

  Sam calls the number she first thinks of x.

  Write an expression for the number that Sam is thinking of after she has done the two calculations.

Form expressions

Reasoning and problem solving

Write expressions for the perimeters of the shapes.

$2x$

a

$2a + 1$

$y + 2$

$6x$
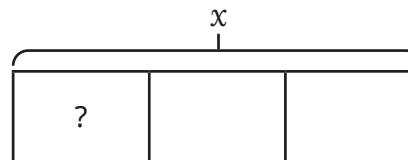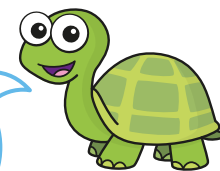
$6a + 2$

$4y + 8$

The perimeter of a rectangle is $12x$.

What could the sides of the rectangle be?

multiple possible answers, e.g. $5x$ and x

x

?

The bar model represents $3x$ because x is the total and there are three parts.

Do you agree with Tiny?

Explain your answer.

No

Each part is $x ÷ 3$

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